

APPENDIX 4

```

/**
 * IPS VPN Tunnel update functions
 * @file update_tunnels.h
 * @author jmccaskey
 */

#ifndef UPDATE_TUNNELS__H
#define UPDATE_TUNNELS__H

#include "snmpwalk.h"

/**
 * Function to update all tunnel related ids for a specific device.
 * The function will find any tunnels involving the device using the passed MySQL connection and
 * then perform the necessary walking and matching to update the tunnel index ids
 * in the database.
 */
int update_tunnels(struct ips_device *device, MYSQL *mysql_connection);

#include "update_tunnels.c"

#endif

```

```

/**
 * IPS VPN Tunnel update functions
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 */

/**
 * Function to update all tunnel related ids for a specific device.
 * The function will find any tunnels involving the device using the passed MySQL connection and
 * then perform the necessary walking and matching to update the tunnel index ids
 * in the database.
 */
int update_tunnels(struct ips_device *device, MYSQL *mysql_connection) {
    MYSQL_RES *result;
    MYSQL_ROW row;
    char *sql_query;
    int n;

    assert(sql_query=malloc(2500));
    n=sprintf(sql_query, 2500, "SELECT tunnel.tunnel_id, tunnel.tunnel_server_id,
tunnel_side_one.tunnel_entry_id as tunnel_entry_id_local, "
        "tunnel_side_one.tunnel_entry_server_id as tunnel_entry_server_id_local, "
        "tunnel_side_one.tunnel_side_id as tunnel_side_id_local, "
        "tunnel_side_one.tunnel_side_server_id as tunnel_side_server_id_local, "
        "tunnel_side_one.sa_id as sa_id_local, tunnel_side_two.tunnel_side_id as
tunnel_side_id_remote, "
        "tunnel_side_two.tunnel_side_server_id as tunnel_side_server_id_remote,
tunnel_side_two.sa_id as sa_id_remote, "
        "tunnel_side_two.tunnel_entry_id as tunnel_entry_id_remote, "
        "tunnel_side_two.tunnel_entry_server_id as tunnel_entry_server_id_remote,
device_one.ip_address as ip_address_local, "
        "device_one.device_id as device_id_local, device_one.device_server_id as
device_server_id_local, "
        "tunnel_entry_one.tunnel_entry_type as tunnel_entry_type_local, "
        "tunnel_entry_two.tunnel_entry_type as tunnel_entry_type_remote, "
        "device_two.ip_address as ip_address_remote "
        "FROM tunnel, tunnel_side as tunnel_side_one, tunnel_side as tunnel_side_two,
"
        "tunnel_entry as tunnel_entry_one, tunnel_entry as tunnel_entry_two, "
        "device as device_one, device as device_two "
        "WHERE tunnel_side_one.tunnel_id = tunnel.tunnel_id "
        "AND tunnel_side_one.tunnel_server_id = tunnel.tunnel_server_id "
        "AND tunnel_side_two.tunnel_id = tunnel.tunnel_id "
        "AND tunnel_side_two.tunnel_server_id = tunnel.tunnel_server_id "
        "AND NOT(tunnel_side_two.tunnel_side_id = tunnel_side_one.tunnel_side_id "
        "AND tunnel_side_two.tunnel_side_server_id =
tunnel_side_one.tunnel_side_server_id) "
        "AND tunnel_side_one.tunnel_entry_id=tunnel_entry_one.tunnel_entry_id "
        "AND
tunnel_side_one.tunnel_entry_server_id=tunnel_entry_one.tunnel_entry_server_id "
        "AND tunnel_side_two.tunnel_entry_id=tunnel_entry_two.tunnel_entry_id "
        "AND
tunnel_side_two.tunnel_entry_server_id=tunnel_entry_two.tunnel_entry_server_id "
        "AND tunnel_entry_one.device_id=device_one.device_id "
        "AND tunnel_entry_one.device_server_id=device_one.device_server_id "
        "AND tunnel_entry_two.device_id=device_two.device_id "

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        "AND tunnel_entry_two.device_server_id=device_two.device_server_id "
        "AND device_one.device_id = %s "
        "AND device_one.device_server_id=%s", device->device_id, device-
>device_server_id);
    //execute query
    if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
        flockfile(stderr);
        fprintf(stderr, "%s: Failed executing query for tunnels associated with device: Error: %s\n",
timestamp, mysql_error(mysql_connection));
        funlockfile(stderr);
        free(sql_query);
    }
    free(sql_query);

    //store results from last query into result
    result=mysql_store_result(mysql_connection);
    //setup snmp session options
    session = ips_snmp_sess_init(device);

    index_node *inode = NULL;
    //loop through each tunnel_side updating its ids
    while(row=mysql_fetch_row(result)) {
        int n;
        char *start_oid, *sql_query;
        queue index_queue;
        queue_init(&index_queue);
        /** Check what type of tunnel we are dealing with and call the walk function */
        if(strcmp(row[15], "cisco_ipsec")==0) {
            //put each digit of the ip address into a separate array element
            unsigned char ipaddress[4] = {0, 0, 0, 0};
            if(row[17] != NULL) {
                char delim[1] = {'.'};
                char *pos;
                pos = row[17];
                //strsep is a gnu c specific extension... it replaces the non thread safe
                (and slower) strtok from ansi c...
                ipaddress[0] = atoi(strsep(&pos, delim));
                ipaddress[1] = atoi(strsep(&pos, delim));
                ipaddress[2] = atoi(strsep(&pos, delim));
                ipaddress[3] = atoi(strsep(&pos, delim));
            }
            assert(start_oid = malloc(200));

            //walk the phase 1 oid
            snprintf(start_oid, 200,
"cipSecPhaseOne.cikeTunnelTable.cikeTunnelEntry.cikeTunRemoteAddr");
            ips_snmpwalk(device, row[15], start_oid, ipaddress, &index_queue, 1);
            free(start_oid);

            //process the queue in order to get the phase 1 id
            int count = 0;
            while(index_queue.head != NULL) {
                if(count > 0)
                    free(inode);
                inode = (index_node *) queue_get(&index_queue);
                ++count;
            }
        }
    }

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    }

    //update the phase 1 id in db...
    assert(sql_query = malloc(800));
    if(count > 0) {
        n=snprintf(sql_query, 800, "UPDATE tunnel_side SET "
            "session_id_one_previous = session_id_one,
session_id_one = %d "
            "WHERE tunnel_side_id = %s AND
tunnel_side_server_id = %s",
            inode->value, row[4], row[5]);
    } else {
        //there was nothing in the queue, so we know we didn't find a matching
        session id, insert NULL
        n=snprintf(sql_query, 800, "UPDATE tunnel_side SET "
            "session_id_one_previous = session_id_one,
session_id_one = NULL "
            "WHERE tunnel_side_id = %s AND
tunnel_side_server_id = %s",
            row[4], row[5]);
    }
    free(inode);

    //flockfile(stdout);
    //fprintf(stdout, "%s\n", sql_query);
    //funlockfile(stdout);

    if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
        flockfile(stderr);
        fprintf(stderr, "%s: Failed executing query to update tunnel_side: Error:
%s\n", timestamp, mysql_error(mysql_connection));
        funlockfile(stderr);
        free(sql_query);
    } else {
        free(sql_query);
    }

    assert(start_oid = malloc(200));
    //walk the phase 2 oid
    snprintf(start_oid, 200,
        "cipSecPhaseTwo.cipSecTunnelTable.cipSecTunnelEntry.cipSecTunRemoteAddr");
    ips_snmpwalk(device, row[15], start_oid, ipaddress, &index_queue, 0);
    free(start_oid);

    //find all cisco phase 2 monitors related to this tunnel side so they can be updated
    assert(sql_query = malloc(1000));
    n = snprintf(sql_query, 1000, "SELECT monitor.monitor_id,
monitor.monitor_server_id "
        "FROM monitor_tunnel, monitor, metric, metric_snmp "
        "WHERE monitor_tunnel.tunnel_side_id=%s AND
monitor_tunnel.tunnel_side_server_id=%s "
        "AND monitor.monitor_id=monitor_tunnel.monitor_id "
        "AND monitor.monitor_server_id=monitor_tunnel.monitor_server_id "
        "AND metric.metric_id=monitor.metric_id "
        "AND metric.metric_server_id=monitor.metric_server_id "
        "AND metric.suite='snmp' "

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        "AND metric_snmp.metric_id=metric.metric_id "
        "AND metric_snmp.metric_server_id=metric.metric_server_id "
        "AND metric_snmp.phase = 'two' ",
        row[4], row[5]);
    if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
        flockfile(stderr);
        fprintf(stderr, "%s: Failed executing query to find phase 2 monitors during
tunnel update: Error: %s\n", timestamp, mysql_error(mysql_connection));
        funlockfile(stderr);
        free(sql_query);
    } else {
        free(sql_query);
    }

    MYSQL_RES *phase_two_result;
    MYSQL_ROW monitor_row;
    phase_two_result = mysql_store_result(mysql_connection);

    while(monitor_row=mysql_fetch_row(phase_two_result)) {
        char *sql_query_delete;
        int len;
        assert(sql_query_delete = malloc(8000));
        //additional where clauses will be appened as we go to avoid deleting the
rows that are still in use...
        len = snprintf(sql_query_delete, 8000, "DELETE FROM
monitor_tunnel_cisco_phase_2 WHERE monitor_id=%s AND monitor_server_id=%s", monitor_row[0],
monitor_row[1]);

        inode = (index_node *) index_queue.head;
        while(inode != NULL) {
            //check if there is already a row for this session id value
            assert(sql_query = malloc(1000));
            n=snprintf(sql_query, 1000, "SELECT COUNT(*) AS count
FROM monitor_tunnel_cisco_phase_2 "
                                "WHERE monitor_id=%s AND
monitor_server_id=%s "
                                "AND phase_2_id=%d ", monitor_row[0],
monitor_row[1], inode->value);

            if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
                flockfile(stderr);
                fprintf(stderr, "%s: Failed executing query for phase 2 row count: Error:
%s\n", timestamp, mysql_error(mysql_connection));
                funlockfile(stderr);
                free(sql_query);
            } else {
                free(sql_query);
            }

            MYSQL_RES *count_result;
            MYSQL_ROW count_row;
            count_result = mysql_store_result(mysql_connection);
            count_row = mysql_fetch_row(count_result);
            int row_count = atoi(count_row[0]);
            mysql_free_result(count_result);
            if(row_count < 1) {
                //there is no row for this session id, create one
                assert(sql_query = malloc(800));
                n=snprintf(sql_query, 800, "INSERT INTO

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monitor_tunnel_cisco_phase_2 "
phase_2_id, counter, timestamp) "
"(monitor_id, monitor_server_id,
"VALUES (%s, %s, %d, 0, 0)",
monitor_row[0], monitor_row[1],
inode->value);
if(mysql_real_query(mysql_connection, sql_query, n)!=0)
{
    flockfile(stderr);
    fprintf(stderr, "%s: Failed executing query to insert into
monitor_tunnel_cisco_phase_2: Error: %s\n", timestamp, mysql_error(mysql_connection));
    funlockfile(stderr);
    free(sql_query);
} else {
    free(sql_query);
}
}
//update the delete query to not delete this row (since it still is in
use)
char *temp_string;
temp_string = strdup(sql_query_delete);
len = snprintf(sql_query_delete, 8000, "%s AND
NOT(phase_2_id=%d) ", temp_string, inode->value);
free(temp_string);
inode = (index_node *)inode->next;
}
//execute the delete for all rows for this monitor that were not still in use
if(mysql_real_query(mysql_connection, sql_query_delete, len)!=0) {
    flockfile(stderr);
    fprintf(stderr, "%s: Failed executing query to delete old phase 2 rows: Error:
%s\n", timestamp, mysql_error(mysql_connection));
    funlockfile(stderr);
    free(sql_query_delete);
} else {
    free(sql_query_delete);
}
}
//cleanup the queue
while(index_queue.head != NULL) {
    inode = (index_node *) queue_get(&index_queue);
    free(inode);
}
mysql_free_result(phase_two_result);

} else if(strcmp(row[15], "netscreen_ipsec")==0) {
assert(start_oid = malloc(200));

//walk the phase 1 oid
snprintf(start_oid, 200, "nsVpnMonTable.nsVpnMonEntry.nsVpnMonSaid");
ips_snmpwalk(device, row[15], start_oid, row[6], &index_queue, 1);
free(start_oid);

//process the queue in order to get the phase 1 id
int count = 0;
while(index_queue.head != NULL) {

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        if(count > 0)
            free(inode);
        inode = (index_node *) queue_get(&index_queue);
        ++count;
    }

    //update the phase 1 id in db...
    assert(sql_query = malloc(800));
    if(count > 0) {
        n=snprintf(sql_query, 800, "UPDATE tunnel_side SET "
            "session_id_one_previous = session_id_one, session_id_one = %d "
            "WHERE tunnel_side_id = %s AND tunnel_side_server_id = %s",
            inode->value, row[4], row[5]);
    } else {
        //there was nothing in the queue, so we know we didn't find a matching session id,
insert NULL
        n=snprintf(sql_query, 800, "UPDATE tunnel_side SET "
            "session_id_one_previous = session_id_one, session_id_one = NULL
            "WHERE tunnel_side_id = %s AND tunnel_side_server_id = %s",
            row[4], row[5]);
    }
    free(inode);

    //flockfile(stdout);
    //fprintf(stdout, "%s\n", sql_query);
    //funlockfile(stdout);

    if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
        flockfile(stderr);
        fprintf(stderr, "%s: Failed executing query to update tunnel_side: Error:
%s\n", timestamp, mysql_error(mysql_connection));
        funlockfile(stderr);
        free(sql_query);
    } else {
        free(sql_query);
    }

    } else if(strcmp(row[15], "altiga_ipsec")==0) {
        assert(start_oid = malloc(200));

        //walk the phase 1 oid
        snprintf(start_oid, 200,
            "alActiveSessionTable.alActiveSessionEntry.alActiveSessionIpAddress");
        ips_snmpwalk(device, row[15], start_oid, row[17], &index_queue, 1);
        free(start_oid);

        //process the queue in order to get the phase 1 id
        int count = 0;
        while(index_queue.head != NULL) {
            if(count>0)
                free(inode);
            inode = (index_node *) queue_get(&index_queue);
            ++count;
        }

```



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//update the phase 1 id in db...
assert(sql_query = malloc(800));
if(count > 0) {
    n=sprintf(sql_query, 800, "UPDATE tunnel_side SET "
        "session_id_one_previous = session_id_one, session_id_one = %d "
        "WHERE tunnel_side_id = %s AND tunnel_side_server_id = %s",
        inode->value, row[4], row[5]);
} else {
    //there was nothing in the queue, so we know we didn't find a matching session id,
insert NULL
    n=sprintf(sql_query, 800, "UPDATE tunnel_side SET "
        "session_id_one_previous = session_id_one, session_id_one = NULL
        "WHERE tunnel_side_id = %s AND tunnel_side_server_id = %s",
        row[4], row[5]);
}
free(inode);

//flockfile(stdout);
//fprintf(stdout, "%s\n", sql_query);
//funlockfile(stdout);

if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
    flockfile(stderr);
    fprintf(stderr, "%s: Failed executing query to update tunnel_side: Error: %s\n",
timestamp, mysql_error(mysql_connection));
    funlockfile(stderr);
    free(sql_query);
} else {
    free(sql_query);
}

} else if(strcmp(row[15], "ips_emulated")==0) {
    assert(start_oid = malloc(200));

//walk the phase 1 oid
sprintf(start_oid, 200, "hrSWRunEntry.hrSWRunIndex");
ips_snmpwalk(device, row[15], start_oid, "25977", &index_queue, 1);
free(start_oid);

//process the queue in order to get the phase 1 id
int count = 0;
while(index_queue.head != NULL) {
    if(inode > 0)
        free(inode);
    inode = (index_node *) queue_get(&index_queue);
    ++count;
}

//update the phase 1 id in db...
assert(sql_query = malloc(800));
if(count > 0) {
    n=sprintf(sql_query, 800, "UPDATE tunnel_side SET "
        "session_id_one_previous = session_id_one, session_id_one = %d "
        "WHERE tunnel_side_id = %s AND tunnel_side_server_id = %s",
        inode->value, row[4], row[5]);
}

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        free(inode);
    } else {
        //there was nothing in the queue, so we know we didn't find a matching session id,
insert NULL
        n=sprintf(sql_query, 800, "UPDATE tunnel_side SET "
            "session_id_one_previous = session_id_one, session_id_one = NULL
            "WHERE tunnel_side_id = %s AND tunnel_side_server_id = %s",
            row[4], row[5]);
    }

    //flockfile(stdout);
    //fprintf(stdout, "%s\n", sql_query);
    //funlockfile(stdout);

    if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
        flockfile(stderr);
        fprintf(stderr, "%s: Failed executing query to update tunnel_side: Error: %s\n",
timestamp, mysql_error(mysql_connection));
        funlockfile(stderr);
        free(sql_query);
    } else {
        free(sql_query);
    }

    assert(start_oid = malloc(200));
    //walk the phase 2 oid
    sprintf(start_oid, 200, "hrSWRunEntry.hrSWRunName");
    ips_snmpwalk(device, row[15], start_oid, "\"apache\"", &index_queue, 0);
    free(start_oid);

    //find all cisco phase 2 monitors related to this tunnel side so they can be updated
    assert(sql_query = malloc(1000));
    n = sprintf(sql_query, 1000, "SELECT monitor.monitor_id, monitor.monitor_server_id "
        "FROM monitor_tunnel, monitor, metric, metric_snmp "
        "WHERE monitor_tunnel.tunnel_side_id=%s AND
monitor_tunnel.tunnel_side_server_id=%s "
        "AND monitor.monitor_id=monitor_tunnel.monitor_id "
        "AND monitor.monitor_server_id=monitor_tunnel.monitor_server_id "
        "AND metric.metric_id=monitor.metric_id "
        "AND metric.metric_server_id=monitor.metric_server_id "
        "AND metric.suite='snmp' "
        "AND metric_snmp.metric_id=metric.metric_id "
        "AND metric_snmp.metric_server_id=metric.metric_server_id "
        "AND metric_snmp.phase = 'two' ",
        row[4], row[5]);

    if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
        flockfile(stderr);
        fprintf(stderr, "%s: Failed executing query for phase 2 monitors: Error: %s\n",
timestamp, mysql_error(mysql_connection));
        funlockfile(stderr);
        free(sql_query);
    } else {
        free(sql_query);
    }

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MYSQL_RES *phase_two_result;
MYSQL_ROW monitor_row;
phase_two_result = mysql_store_result(mysql_connection);

    while(monitor_row=mysql_fetch_row(phase_two_result)) {
        char *sql_query_delete;
        int len;
        assert(sql_query_delete = malloc(8000));
        //additional where clauses will be appened as we go to avoid deleting the rows that
are still in use...
        len = snprintf(sql_query_delete, 8000, "DELETE FROM
monitor_tunnel_cisco_phase_2 WHERE monitor_id=%s AND monitor_server_id=%s", monitor_row[0],
monitor_row[1]);

        inode = (index_node *) index_queue.head;
        while(inode != NULL) {
            //check if there is already a row for this session id value
            assert(sql_query = malloc(1000));
            n=snprintf(sql_query, 1000, "SELECT COUNT(*) AS count FROM
monitor_tunnel_cisco_phase_2 "
                "WHERE monitor_id=%s AND monitor_server_id=%s "
                "AND phase_2_id=%d ", monitor_row[0],
monitor_row[1], inode->value);

            MYSQL_RES *count_result;
            MYSQL_ROW count_row;
            int row_count;

            if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
                flockfile(stderr);
                fprintf(stderr, "%s: Failed executing query for phase 2
row count: Error: %s\n", timestamp, mysql_error(mysql_connection));
                funlockfile(stderr);
                free(sql_query);
                row_count = 0;
            } else {
                free(sql_query);
                count_result = mysql_store_result(mysql_connection);
                count_row = mysql_fetch_row(count_result);
                row_count = atoi(count_row[0]);
                mysql_free_result(count_result);
            }
            if(row_count < 1) {
                //there is no row for this session id, create one
                assert(sql_query=malloc(800));
                n=snprintf(sql_query, 800, "INSERT INTO monitor_tunnel_cisco_phase_2 "
                    "(monitor_id, monitor_server_id, phase_2_id, counter,
timestamp) "
                    "VALUES (%s, %s, %d, 0, 0)",
                    monitor_row[0], monitor_row[1],
inode->value);

                if(mysql_real_query(mysql_connection, sql_query, n)!=0) {
                    flockfile(stderr);
                    fprintf(stderr, "%s: Failed executing query to
insert into monitor_tunnel_cisco_phase_2: Error: %s\n", timestamp, mysql_error(mysql_connection));
                    funlockfile(stderr);

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        free(sql_query);
    } else {
        free(sql_query);
    }
    }
    //update the delete query to not delete this row (since it still is in
use)
    char *temp_string;
    temp_string = strdup(sql_query_delete);
    len = snprintf(sql_query_delete, 8000, "%s AND NOT(phase_2_id=%d) ",
temp_string, inode->value);
    free(temp_string);
    inode = (index_node *)inode->next;
    }
    //execute the delete for all rows for this monitor that were not still in use
    if(mysql_real_query(mysql_connection, sql_query_delete, len)!=0) {
        flockfile(stderr);
        fprintf(stderr, "%s: Failed executing query to delete old phase 2
rows: Error: %s\n", timestamp, mysql_error(mysql_connection));
        funlockfile(stderr);
        free(sql_query_delete);
    } else {
        free(sql_query_delete);
    }
    }
    //cleanup the queue
    while(index_queue.head != NULL) {
        inode = (index_node *) queue_get(&index_queue);
        free(inode);
    }
    mysql_free_result(phase_two_result);

    }
    //...
}
mysql_free_result(result);

return(0);
}

```